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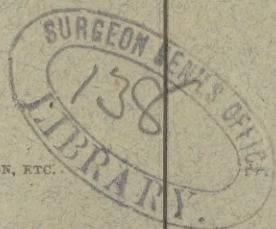
NASAL STENOSIS:

ITS INFLUENCE ON OLFACTION, AUDITION, VOCALIZATION,
AND RESPIRATION, AND ITS TREATMENT.

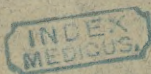
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By J. O. ROE, M.D.,

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FELLOW OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION, ETC.



(Read before the New York State Medical Society, February 1, 1881.)



Reprinted from THE MEDICAL RECORD, April 30, 1881.

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NASAL STENOSIS:

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NASAL STENOSIS.

THE office of the nose in the animal economy is a very important one.

Besides being a part of the mechanism of facial expression, it performs four very important functions: 1st, it contains within its cavities one of the organs of special sense, that of olfaction; 2d, it affords access of air or ventilation to the middle ear, or tympanum, through the nasal passages and Eustachian tube; 3d, it enters as a prominent factor into the mechanism of vocalization; 4th, it is a very important portion of the respiratory apparatus in affording protection to the organs below.

For the proper performance of any or all of these functions the essential and indispensable condition is a clear and unobstructed passage through both the nasal openings.

Obstructions of the nasal passages may be divided into three principal classes: 1st, those arising from defective growth or deformity of the cartilaginous and bony framework; 2d, those existing in the soft parts, resulting from hypertrophic or other diseased conditions; 3d, those caused by foreign bodies and neoplastic growths.

I. *Obstructions in the hard parts.*—In studying the development of the nose as compared with the growth of other parts and organs, we find that it takes place much more slowly, and that the size of the nasal cavities in children are much smaller relatively than in adults.

The antra of Highmore, which are the first of the sinuses to appear, begin to be formed about the fourth month of fetal life, and at birth are very small, round cavities, but as development takes place they become large, irregular, and pyramidal.

The frontal sinuses and ethmoidal cells do not begin to form until two years later.

At birth the vertical plate of the ethmoid is cartilaginous, but the vomer is already ossified. The cribriform plate is a mere membrane continuous with

the falx cerebri of the dura mater, and attached behind to the partially ossified body of the sphenoid.¹

It is this late development of the central portion of the face and skull, and more particularly of the frontal eminences and sinuses, that gives a flattened appearance to the nose of the infant.

As a result of this tardy growth many errors of development take place.

To those heretofore recognized, viz., hare-lip, cleft palate, cervical fistulæ, and dermoid tumor, Dr. Harrison Allen, of Philadelphia, adds another, the asymmetrical rate of growth between the visceral arches, which prevents the perfect shaping of the oral and nasal cavities.² Thus, when one arch has not grown as actively as the other, the nasal chamber on the same side will be found narrowed and obstructed, and the septum deflected to that side, while the opposite chamber will be large and capacious.

In these cases of congenital deformity of the oral and nasal cavities the teeth will also be found irregular, the permanent incisors overlapping and convergent, the two halves of the upper dental arch more or less V-shaped, the vault of the mouth high and narrow, and the nose very peculiarly prominent and projecting.

This projecting appearance of the nose is due to two causes: 1st, a retarded growth of the perpendicular plate of the ethmoid; 2d, a high-pitched and narrow, hard palate. This prevents the vomer from growing downward, and not being able to grow backward, it is crowded forward, thus producing the projecting and often unsightly nose. In addition to these errors in developmental force, we have another force operating on these delicate and yielding parts, when the nasal passages become occluded. It is the suction caused by deglutition and the repeated attempts at inspiration through the nose, which tend to produce a partial vacuum in the nasal chambers, thereby preventing them and the frontal eminences from expanding, and causing the antra to remain small and undeveloped.

Deviation of the septum from the normal median line is a frequent cause of nasal obstruction. The

¹ Watson: Diseases of the Nose, p. 22.

² Philadelphia Medical Times, December 6, 1879, p. 120.

frequency of its occurrence has been shown by Dr. Allen³ in his study of fifty-eight adult crania preserved in the Wister and Horner Museum. Of these only eighteen exhibited normal nasal chambers; in the remaining forty, nineteen were found in which the curvature was so great as to be in contact with the superior and middle turbinated bones. In forty-nine skulls examined by Semeleder, the septum was straight in ten of them, bent toward the left in twenty, toward the right in fifteen, and in four it was in the shape of an S.

Usually, the deflection is in the anterior portion of the septum, although there may be as many as three distinct curves, thus forming in shape a letter S, and thereby occluding both nostrils.

I have recently had under treatment a child four years old, having a severe catarrhal trouble and incipient deafness. In this case the septum had three distinct curves, closing both nostrils. This was congenital, and the nostrils had been impervious to air since birth.

In children with deformed nasal septa the external contour of the nose is usually straight, but, as the child develops, the growth of the septum turns the nose to one side, narrowing or nearly closing one or both nostrils. This is also the case with the cartilaginous portion, whether from congenital deformity or accidental displacement of the cartilage, which has been allowed to go uncorrected.

Deflection or deformity of the nose is often produced by the common practice of pressing more firmly on one side than the other in the act of blowing, in order to force out a profuse or tenacious secretion from the other side.

Beclard explains it by the habit of wiping the nose with the right hand, as it is most often turned to that side, while in left-handed people it is turned to the left side. I have seen several cases in which the septum was deflected to such a degree from this cause as to greatly narrow the calibre of the nostrils.

In other bony structures of the nasal fossa we meet with deformities diminishing its calibre.

³ American Journal of Medical Science, January, 1880, p. 70.

Not unfrequently one or more of the turbinated bones are very large, and projecting across to the vomer, occluding or greatly narrowing the nostril; and, as has been observed by Lennox Browne, the nostril may also be occluded by angular curvature forward of the upper cervical vertebra.⁴

II. *Obstruction by the soft parts.*—The form of nasal obstruction which is most frequently found in the soft parts is a hypertrophied or turgescient condition of the tissues covering the inferior and middle turbinated bones and the lower half of the septum. The cause for this is in the histological structures of the tissues of this region.

Each nasal passage is divided anatomically into three distinct regions, viz.: the *vestibule*, the *respiratory region*, and the *olfactory region*.

The vestibule, the anterior portion of the nasal cavity, contains but little loose cellular tissue, but few blood-vessels, and accordingly it is rare that an obstruction occurs in the soft parts of this region, except from membranous occlusion. The olfactory region is located in the superior portion of the passage, and extends downward to the upper border of the middle turbinated bone, and to a corresponding extent on the septum, where the olfactory nerve is supposed to terminate. The respiratory passage is that portion of the cavity below this point, and is a continuation of the respiratory track.

The tissues of these two regions differ greatly in character and thickness. The mucous membrane covering the superior portion is scantily supplied with blood-vessels, and is quite thin, except where the olfactory nerve is distributed. Here the membrane is thick, soft, and pulpy, and contains numerous glands of Bowman, which are peculiar to this region.

In the respiratory portion the mucous membrane and submucous tissue is thick and vascular and contains numerous mucous glands. In addition to the numerous venous plexuses, which are here found very abundant, particularly over the posterior portion of the turbinated bones and the septum, there exists a true erectile tissue analogous to the cavernous tissue of the penis. The analogy of this tissue in the

⁴ British Medical Journal, August 24, 1878, p. 382.

nares to the erectile tissue of the genital organs was observed by Kohlrausch⁵ twenty-seven years ago. Afterward, Kölliker⁶ observed the same similarity; but to Prof. Bigelow, of Boston, is due the honor of



FIG. 1.—Portion of upper jaw, showing inferior and middle turbinated bones, sections of turbinated corpora cavernosa, inflated, dried, and magnified two diameters (after Bigelow).

demonstrating the identity of these tissues, and pointing out the connection of this erectile tissue in the nose with nasal disease. To this he gave the

⁵ Müller's Archives, 1853, p. 149.

⁶ Handbuch der Gewebelehre des Menschen, p. 741. Leipzig, 1867.

name of "turbinated corpora cavernosa,"⁷ microscopic sections of which are shown in Figs. 1 and 2.

A study of this tissue, in connection with frequent colds in the head, discloses the key to the great prevalence of obstructed nostrils from hypertrophied tissue, and also of nasal catarrh.

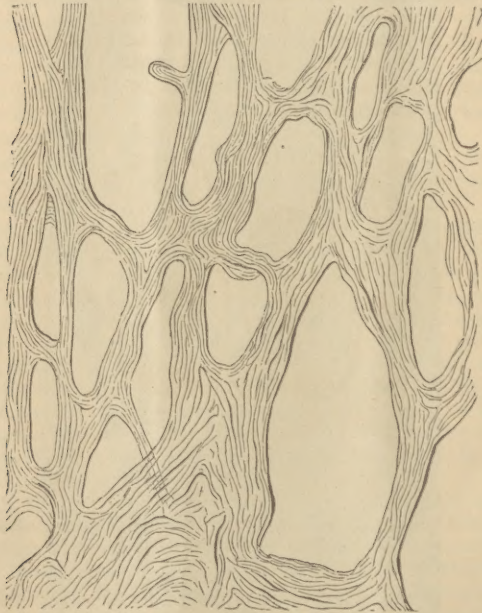


FIG. 2.—Section of posterior extremity of a turbinate corpus cavernosum, hardened in alcohol, treated with iodine and glycerine, and magnified ninety diameters, showing cavities, walls, and trabeculae (after Bigelow).

The rarity of the recognition of this cause leads Professor Bigelow to remark that "it will be perhaps conceded that practitioners are not generally familiar with this anatomy, of which they will readily make a practical application."⁸

⁷ Boston Medical and Surgical Journal, April 29, 1875.

⁸ Op. cit., p. 492.

It is the engorgement of this tissue which causes the sudden impaction of the nose in attacks of acute coryza or on exposure to irritants, and not simply engorgement of the vascular mucous membrane, as is so commonly supposed. The effect which prolonged engorgement of this cavernous tissue will produce in the surrounding parts is illustrated by the case cited by Dr. Bumstead of an attack of urethritis, which was brought on by an excitement of one day's duration.⁹ Thus, as a result of each cold or engorgement, from whatever cause, there is more or less proliferation and exudation of plastic mate-

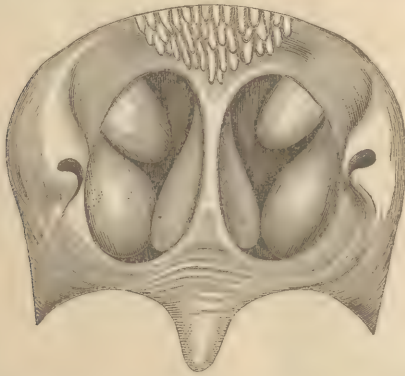


FIG. 3.—Represents the posterior or rhinoscopic appearance of the inferior and middle turbinated bones and the septum, showing the hypertrophied tissue.

rial into the surrounding tissues, which, becoming organized, leads to permanent hypertrophy. The accompanying illustrations represent this hypertrophy, not to an extreme degree, but, as we more commonly find it, as taken from one of a number of similar cases in the practice of the writer.

We can readily understand from the nature of this tissue, being as it is under the control of the vasomotor nerves, subject and very sensitive to emotional influence from various external impressions, how it is that the nostrils will become so suddenly

⁹ Venereal Diseases, p. 44. 1879.

closed from slight exposure to local irritating causes, as dust, acrid vapors, and the like; or from peripheral reflex causes; as sitting in a slight draught or sudden exposure to cold chilling the surface of the body; or from cold hands or feet. Turgidity of this tissue is often caused by emotions. The emotional effect of a blush is also participated in by the other parts as well as by the cheek.

It is often observed that in conditions of apparently slight cold one nostril may be closed when soon there will be an interchange to the opposite nostril, the first nostril becoming free. This is undoubtedly due to the functional activity of the coats

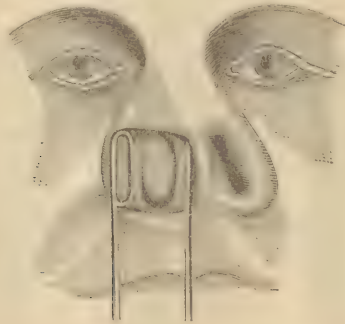


FIG. 4.—Represents the anterior appearance of the hypertrophy on the inferior turbinated bone.

of the vessels. When the nostril becomes closed the local irritant is excluded and the engorgement soon subsides. Cold air is a common cause of these turgescences. The first effect of it, or of any slight irritant or stimulant, will often be to unload the tissues, but soon the vessels will dilate and increase the obstruction beyond its previous condition.

Etiology.—Hypertrophy of the nasal mucous membrane can invariably be traced to a catarrhal origin. In many cases it is supposed to be due to a catarrhal, strumous, tuberculous, rachitic, or gouty diathesis, which, to my mind, are only so many terms to indicate different and peculiar manifestations of a broken-down, anæmic, or impoverished condition

of the system, in consequence of which the circulation is sluggish and the vitality is low, and, not being able to resist the sudden changes to which they are subjected, the parts most exposed become engorged and impairment or disorganization takes place.

Thus, if catarrh is seen affecting persons in otherwise robust health, it is considered a purely local disease. If it is seen in the same individual when the system has become impaired and the lymphatics involved, it is considered to be of strumous or scrofulous origin. If it is also seen in the same individual when tuberculosis has followed, it is then considered to be of tuberculous origin. Those cases with marked tendency to engorgement of the lymphatics are very often associated with adenoid hypertrophies in the vault of the pharynx, and in tuberculous patients there is often caseous degeneration and ulceration, sometimes ending in suppuration.

Catarrh is often thought to be hereditary, because the person's ancestors have been troubled with it; but, as I see it, they inherit a physical organism of low vitality and favorable to the development of this class of diseases. Catarrh, therefore, is the prime and great cause of these hypertrophies, and the consequent narrowing or closing of the nasal passages, and catarrh is the result almost invariably of neglected colds, which are allowed to run their course unchecked. From each cold results a slight augmentation of the hypertrophy, until sufficient has taken place to become in turn a cause for further and continued trouble.

In addition to obstruction and atresia of the nasal passages by hypertrophied tissue or by a congenital osseous deformity, a variety of other pathological processes may produce this condition—such as syphilitic ulcerations and cicatricial contractions, polypi, and other tumors and neuroses.

Functions depending on unobstructed nasal passages.

—We will now briefly consider the functions depending on normally free and unobstructed nasal passages, viz.: *Olfaction, audition, vocalization, and respiration*, and the manner in which these become impaired or deranged by the narrowing or closing of these passages.

Olfaction.—In the perfect performance of the ol-

factory function there is of necessity a free and complete interchange of the air in the nasal cavities during each respiration, by which means the odoriferous particles are brought in contact with the terminal fibres of the olfactory nerve.

To fully perceive a very delicate odor we instinctively snuff or draw the air forcibly through the passages to carry the odorous particles with full force and in greater quantities up into the olfactory region; consequently, if the free circulation of air through the nose is obstructed or cut off altogether, the sense of smell becomes correspondingly impaired. In many instances, however, the impairment of the sense of smell is not proportionate to the degree of respiratory obstruction. This is owing to the greater frequency of obstruction of the lower than of the upper passage by the vascular tissue.

The sense of smell is also impaired by the extension of the disease in the respiratory passage by continuity of tissue, to the tissue of the olfactory region, involving the free ends of the olfactory cells, or covering them with mucus, which intercepts the odorous particles. Thus the sense of smell is affected by any obstruction of the circulation of air through the nasal passages. This is equally true whether the obstruction is located anteriorly or posteriorly, or at the region of olfaction.

Effect on the voice.—The tortuous nasal passages have the effect on the voice to increase its resonance, or to re-enforce it, as it is termed—an effect similar to that of the sounding-board in the piano, or, to use a better illustration, of the long and curved pipe in the horn or cornet.

In addition to the nasal cavities we have six sinuses—two maxillary, two frontal, and two sphenoidal—which communicate with the nasal cavities and also act as resonators to the voice.

These are evidently somewhat analogous in their effect to the reverberations produced by the fossæ found in the os hyoides in howling monkeys.¹⁰

Obstruction of the nasal passages has a marked effect on the acoustic properties of the voice.

It is a very common observation in case of attacks

¹⁰ Watson: Diseases of the Nose, loc. cit., p. 19.

of acute nasal catarrh, or coryza, where the nasal passages are blocked by the swollen pituitary membrane, that the voice loses its timbre or resonant qualities, and, in common parlance, we "speak through the nose;" a term, however, which expresses a condition directly opposite to the one that in reality exists. The peculiar thickness in the articulation, and indistinctness of enunciation, or so-called stagnation¹¹ of the tone, caused by partially obstructed nostrils, is most marked in pronouncing words ending in "ing," when the nasal ending is cut off. This defective enunciation and unpleasant nasal twang is to be observed in many public speakers, and is made painfully apparent to their listeners by the absence of euphony from their most rounded and polished sentences.

In cases of complete obstruction, the letters "m" and "n" become perverted into "b" and "d," as was first pointed out by Meyer¹² to be the case in obstruction from adenoid growths. The manner in which this substitution takes place is very clearly explained by Löwenberg.¹³ In obstructed nares, much of the melody, richness, and fulness of the singing voice is lost. The highest, the head-tones, and usually the richest tones of the voice, are absent, and accordingly the voice becomes flat and nasal.

Effect on the ear.—Toynbee first demonstrated by a series of experiments the altered condition of atmospheric pressure in the fauces and ears when swallowing with closed nostrils.

Lucae repeated these experiments, and also observed that, with obstructed nostrils, these changes in atmospheric pressure produced abnormal tension of the membrana tympani, which gradually produced indistinctness in hearing.¹⁴

Let us briefly consider the manner in which these changes are produced. With the completion of the first stage, and during the second stage, in the act of

¹¹ Merkel: Stimm- u. Sprachorgan, S. 652.

¹² Medico-surgical Transactions, vol. liii., p. 191. London, 1870.

¹³ Les Tumeurs Adénoïdes du Pharynx Nasal, p. 26. Paris, 1879. Or, vide the writer's article, Adenoid Growths in the Vault of the Pharynx: their Removal by the Galvano-Cautery. New York MEDICAL RECORD, September, 1879, p. 245.

¹⁴ Verhandlg. der Berliner med. Ges., 1867-68, S. 133; Ziemssen's Cyclopædia, vol. iv., p. 111.

swallowing, the nasal passages and the upper pharyngeal space are almost completely shut off from the pharynx by the soft palate being closed firmly against the posterior pharyngeal wall.

In the third stage of this act, the pharyngeal constrictors close by reflex action on the substance swallowed, and force it onward in its course to the stomach, and at the same time air is exhausted from the naso-pharyngeal space and middle ear, by the suction naturally following the descent of the bolus. This tendency to produce a partial vacuum is prevented by air entering freely through the nasal passages, and the normal air-pressure in the posterior nares and middle ear is maintained.

If the anterior nasal passages become closed, it is readily perceived that, during each act of swallowing, a corresponding degree of disturbance in air-pressure will take place in the nasal cavity, and in the ear also, because of the direct communication through the Eustachian tube.

This aural pressure one can very easily illustrate on himself by closing the nostrils while swallowing, when a marked sensation of pressure will be felt in both ears, supposing the Eustachian tubes to be unobstructed, and with the aural speculum this movement inward of the drum-head can readily be seen.

I have found it to be a rule that when the nostrils are not free enough to permit one to breathe entirely through them, even during a brisk walk, they are not sufficiently free to maintain the aural equilibrium during continued acts of swallowing.

It is an undoubted fact that, even in a state of repose, air continually permeates the Eustachian tubes,¹⁵ and that more or less of the aerial¹⁶ conduction of the sounds of the voice in autophony is through the Eustachian tubes..

Were this not the case, and did air enter the ears only during the act of deglutition, as stated by most authorities, an uncomfortable aural pressure and a slight impairment of the hearing would not take

¹⁵ This view is quite elaborately advocated in an article on "The Method of Air-Supply to the Middle Ear," by Dr. Thomas F. Rum-bold, St. Louis Medical and Surgical Journal, July 20, 1880.

¹⁶ "Hearing by the Aid of Tissue-Conduction, the Mouth-Trumpet, and the Audiphone," by Samuel Sexton, M.D., American Journal of Otology, April, 1880.

place almost immediately upon the stoppage of the Eustachian tubes by a plug of mucus, or from any other cause, whereas one may remain for hours, awake or asleep, without swallowing, and yet the ears and hearing remain perfectly normal.

Thus we see that a continually free communication of the external air with the middle ear is necessary to perfect hearing, and as the air cannot be supplied to the tympanic cavity by any other route than through the nasal passages and Eustachian tubes, so the aural pressure is lessened in proportion to the degree of nasal obstruction.

If the obstruction is great, aural changes take place rapidly; if it is only slight, they go on more slowly, sometimes imperceptibly, and sooner or later the most serious functional and structural changes take place.

The continuous external pressure increases the concavity, and causes a rigidity of the *membrana tympani*.

From this results an inactivity of the ossicular chain, and from this inactivity the delicate articulations become stiffened, impacted, and finally immovable. Besides, the *tensor tympani* muscle and ligament become relaxed and ultimately rigid from disuse, so that, as remarks Cassells,¹⁷ "were it possible, which it seldom is, to remove the other consequences of altered tension, this contracted tendon and ligament mars the best efforts of the practitioner to effect an improvement."

The characteristic symptoms are gradually increasing deafness, giddiness, distressing tinnitus, which diminish or altogether pass away as the deafness deepens.

If this condition is still allowed to go unrelieved, another and sometimes more serious set of changes supervene. In consequence of the catarrh and thickening of the mucous membrane of the naso-pharynx, the Eustachian tubes become invaded, and concentrically closed, 1st, by the collapse of their flaccid walls by the suction or negative pressure; 2d, by the catarrh and thickening of the mucous mem-

¹⁷ In a masterly article, with the striking title, "Shut Your Mouth and Save Your Life," J. F. Cassells, *Edinburgh Medical Journal*, February, 1877, p. 740.

brane of the naso-pharynx invariably attending nasal stenosis.

The air thus shut up in the tympanic cavities is speedily disposed of, and, as a result of the diminished pressure, engorgement of the lining membrane of the cavity follows, and free serous transudation takes place sufficiently to fill the tympanum, and from the pressure of the imprisoned fluid the membrana tympani gives way, and an otorrhœa is established. Thus, when "unrelieved by art, nature attempts, although in a rude way, to perform a natural cure," by establishing an opening to the middle ear.

Effect of nasal stenosis on the organs of vocalization and respiration.—An office of most vital importance which the nasal passages perform is the protection which they give to the throat and lungs in the modification of the air we breathe, rendering it suitable for respiration.

The evil consequences of mouth-breathing are scarcely appreciated by those who have not studied or stopped to consider its effects.

Occasional allusion has been made to the subject by medical writers, but the first to draw definite attention to the serious results of mouth-breathing was George Catlin, the famous American traveller, whose accuracy of observation on this subject, for a non-medical man, was quite remarkable. Catlin observed the practice of mouth-breathing to be "the most destructive of all habits," and applied to it the classical but significant name of "malo-inferno," and remarked: "If I were to endeavor to bequeath to posterity the most important motto which human language can convey, it should be in three words, *Shut your mouth.*"

The importance of this injunction can scarcely be too forcibly impressed on the minds of all.

The lower animals are nose-breathers, many of them by necessity, as they are not provided with a communication between the mouth and the respiratory passage. This we find to be the case with the solipeds.

That man was intended to be a nose-breather is clearly shown by the fact that the first inspiration of the newly born babe is through the nostrils, and if these passages are closed the child can scarcely

breathe at all, even though the mouth be open and unobstructed.

Cases are known of suffocation occurring in infants from closure of the nares alone.

That air enters the nostrils of the infant before it enters the mouth is shown by Cassells by cases in which "air was found in the tympanic cavities of the newly born infant, when no air could be demonstrated to be present in the lung-tissue."¹⁸

When the nares become closed, it is a long time before we can become accustomed to the perverted process.

Many of the troubles of the pharynx, larynx, and lungs are the direct result of mouth-breathing.

The disease called clergyman's sore throat, common to public speakers and singers, is caused, not by the excessive use of the throat, but by the excessive amount of mouth-breathing commonly indulged in while speaking or singing.

If we will observe a collection of people on a foggy or dusty day, or in a dusty hall, we will at once notice the prevalence of mouth-breathing, and the marked contrast between the quiet, noiseless breathing of the nose-breathers, and the coughing, sputtering, and spasmodic action of the respiratory muscles of those who are mouth-breathers.

The air is not only freed from dust and foreign substances by passing through the nose, but moisture is imparted to it and its temperature elevated,¹⁹ thus rendering it more uniform and suitable for respiration. When nasal respiration is cut off there is a noticeable diminution in the air-supply to the lungs, which, as Berhart²⁰ observes, can be readily ascertained by listening to the chest of one who alternately breathes through the mouth and the nose.

Many cases of spasmodic asthma are due directly to polypi and other conditions occluding the nasal passages, as was first pointed out by Voltolini.²¹

¹⁸ Op. cit., p. 730.

¹⁹ Milne Edwards: *Anatom. et Physiol. Comp.*, tome ii., p. 266. It has been shown by experiment that the air is raised in temperature ²⁰ higher when respired through the nose than when by the mouth. Goodwillie: *Med. Gazette*, N. Y., July 31, 1880.

²⁰ Asthma: its Pathology and Treatment, p. 238. London, 1878.

²¹ Galvano-Kaustic, S. 246, U. 312. 1871.

Symptoms.—The symptoms attending nasal stenosis have been mainly enumerated in detailing the derangements of the various functions which depend on free nasal passages—as inability to breathe through the nose and consequent impairment of the sense of smell, with its accompanying absence of the perception of flavors; deafness; hoarseness, and disturbances in speech; respiratory obstruction; asthma; inability to remove the nasal secretions; a painful dryness and parching of the throat; a sense of fulness and pressure about the nasal and frontal region; often more or less persistent frontal headache; a dull and languid feeling, with indisposition or incapacity for mental effort; weakness of the eyes, which become painful and congested on reading for a short time; a constantly open mouth, giving to the countenance a vacant, silly expression; and a sensation of taking cold on slight unfavorable changes in the weather.

A person who breathes through the mouth almost invariably snores during sleep. He is restless and his sleep broken. "Tired nature's sweet restorer, *balmy* sleep," is seldom known to the mouth-breather.

He is apt to arise with a feeling of lassitude and general malaise, an unpleasant, bad taste in the mouth, and a morning headache.

A few or many of the above enumerated symptoms may be present in one case at one time, but nasal obstruction is almost invariably attended by all the symptoms of an obstinate and annoying nasal catarrh, and in many cases by offensive breath and serious derangements of the digestive organs. In infants there is also an inability to take the breast and breathe at the same time.

Diagnosis.—The objective symptoms are invariably sufficient for a diagnosis.

The two conditions most liable to be confounded on a subjective examination are the hypertrophy of the tissues covering the turbinated bones, polypi, or other tumors, but these can readily be differentiated by the situation and appearance and by exploration with a probe.

Treatment.—The treatment of nasal stenosis may be divided into constitutional and local. The local may again be divided into conservative and radical.

The constitutional treatment should be such as to build up the system and remove any constitutional disease or dyscrasia which may be present and which may have caused or aggravated the local difficulty. Further than this it cannot be of avail.

The conservative local treatment advised for the removal of nasal hypertrophies are such as the use of medicated solutions applied by means of the douche or spray, the use of powders blown or snuffed into the nostrils, medicated soft gelatine bougies, and the like; but as they are those so commonly employed in the treatment of nasal catarrh, and are not often satisfactorily effective, I will not attempt to discuss them here. In some instances, however, where the obstruction consists in the recent tumefaction or infiltration of the soft parts, these measures will prove of service, but in the great majority of instances radical means are the only ones that will prove permanently successful.

The radical treatment consists in speedy and complete removal by surgical or chemical means of the obstruction, whether it results from a deflected septum, a membranous occlusion, hypertrophied tissue, or neoplastic growths.

Removal of obstructions located in the bony framework.—Hoppe²² employs for the forcible separation of the abnormally approximated bones, a pair of thin long-armed forceps, by the opening of which the bones are driven apart. If the obstruction is due to a deflected septum bent throughout, or nearly throughout its whole length, the most successful operation for correcting it is that proposed by Mr. William Adams,²³ of London, and modified by Dr. Weir, of New York, and which was so ably detailed to this society by Dr. Weir one year ago.²⁴

In other cases, where the obstruction is caused by an abrupt curve or bulging in the septum, the most successful and easiest plan is to excise it by means of a pair of Rupprecht's²⁵ or Blandin's²⁶ punch-forceps.

²² Ziemssen's Cyclopaedia, vol. iv., p. 14.

²³ Watson's Diseases of the Nose, op. cit., p. 305.

²⁴ New York MEDICAL RECORD, p. 279, March 13, 1880; also Trans. N. Y. State Medical Society, p. 273, 1880.

²⁵ Wien, med. Wochenschrift, S. 1157, 1868. Ziemssen's Cyclop., vol. iv., p. 114.

²⁶ Dict. Encyclopéd. des Sciences Med. et Chirurg., article Nez.

Where there is an exostosis or a spicula of cartilage or bone projecting from the side of the vomer, a very convenient instrument for its removal is the small double-gouge forceps devised by Dr. Weir.²⁷ These I have also found very serviceable for removing similar growths from the turbinated bones.

Dr. Goodwillie²⁸ recommends, and reports excellent results from, the use of a surgical engine for drilling away these exostoses on the turbinated bones and septum by the revolving multiple knife enclosed within a sheath.

Dr. Cohen²⁹ also reports an interesting case of exostosis from the palatine ridge of the superior maxilla and vomer, occluding the right nostril, which he removed with the burr of the dental engine.

Removal of obstructions located in the soft parts.—The most common obstruction is that of hypertrophy of the tissue, and chronic engorgement of the erectile cavernous structure before described.

Among the chemical agents employed are the various caustics, as nitric acid, chromic acid, London and Vienna pastes, nitrate of silver, and glacial acetic acid. The latter has come quite recently into use, but is the most useful of them all. It is applied with a flat probe wound with cotton. The slight stinging pain which it causes quickly passes away, or can be immediately relieved by a few sniffs of chloroform. It causes but slight irritation or inflammation, not more than a slight stuffiness of the nostril for from twelve to twenty-four hours, after which the cauterized tissue is discharged for two or three days in the form of whitish, membranous shreds, with a corresponding diminution in the secretion and obstruction. The septum, where not to be touched, is protected by introducing Shurley's speculum.

The London and Vienna pastes are made of the proper consistency by mixing with absolute alcohol, and are applied in a similar manner.

Chromic acid is most conveniently applied in a similar manner, by adding just sufficient water to liquefy the crystals, but if it is desired to localize its

²⁷ New York MEDICAL RECORD, op. cit., p. 281.

²⁸ Surg. Treat. of Naso-Pharyng. Catarrh: New York Med. Gazette, July 31, 1880.

action to a limited spot, it is best applied in the crystal. Its special advantage is that it causes but very slight pain.

The most deeply eroding escharotic which we have, is nitric acid. The main difficulty has been to limit its action, but with the guarded canula devised by Dr. A. H. Smith, of New York, for applying it, this difficulty is obviated.

Its two main disadvantages are, that a severe burning pain may follow the application for several hours, sometimes for twenty-four hours or more, and a troublesome ulceration, very slow to heal, may result.

After the application of each of these escharotics, the nostrils should be washed out with a spray of Dobell's solution, to remove any free caustic on the surface.

The above enumerated agents will, as a rule, be found most efficient in cases of simple and moderate hypertrophy, but in cases where the membrane is greatly hypertrophied, or where the obstruction consists of a chronic distention of the cavernous vascular tissue, they are inefficient, unless perseveringly applied. In these cases a great number of applications are required, which become tedious to both patient and physician.

Each application of the escharotic only removes a superficial portion, and should be repeated as soon as the slough comes away and the surface is clear, which is ordinarily in about six or eight days. The passages in the interim should be kept clear by frequent cleansing with the posterior nasal syringe, or the anterior and post-nasal spray, with Dobell's solution.

In regard to the use of nitrate of silver in the nares, I fully concur with Dr. Bosworth,²⁹ that owing to its powerfully stimulating qualities, it is often positively injurious, from the increased stimulus it gives to the morbid process; but in the treatment of morbid processes requiring stimulation, it is invaluable.

Gradual dilatation is employed by some, to cause absorption of the hypertrophy.

²⁹ Philadelphia Med. and Surg. Reporter, p. 30, July 13, 1878.

³⁰ Some of the Unsettled Questions Concerning Nasal Catarrh: MEDICAL RECORD, New York, p. 508, November 6, 1880; or, Diseases of the Throat and Nose, p. 199. 1881.

Hoppe³¹ uses hollow bougies as dilators, in narrowing to a moderate degree.

He also recommends the use of pieces of gum-elastic catheter, passed through the nostrils, in cases of coryza of the new-born, in whom breathing during the act of suckling is otherwise impossible.

Dr. Wagner, of New York, employs gradual dilatation with sponge tents, or soft metallic bougies, made of different sizes.

The most radical and efficient plan of treatment for removing these hypertrophic and vascular obstructions to the nasal cavities is the use of the galvano-cautery.

The employment of this most potent agent in such delicate and sensitive passages, would at first thought seem heroic, but the very frequent failures of all other means gradually led to its adoption, as its usefulness had been demonstrated on other parts.

The advantages which it possesses over all other modes of treatment are the thoroughness of its operation, the ease with which it can be applied and controlled and its action limited with our improved electrical instruments, and the healthful tissue changes which it stimulates in the immediately surrounding parts.

The priority of the application of it in the treatment of diseases of the nasal passages is claimed by Dr. Thudicum, of London.³² He began its use in the removal of nasal polypi sixteen years ago.

Each operator, as a rule, adopts a different method for arriving at the same result, and accordingly uses the form of instruments best adapted for his method. Thus, Voltolini uses an electrode with a single wire-loop point; Michaels, of Bonn, wire loop *éraseur*; Thudicum, of London, a wire loop; each of them depending on engaging the mass within the wire.

Lennox Browne, of London, employs a bullet-pointed electrode, and destroys the tissue as it passes in already heated. Drs. Shurley, of Detroit, and Bosworth, of New York, use a slender knife electrode, and remove the mass by cutting through it or by making linear incisions through the tissue, de-

³¹ Ziemssen's *Cyclopædia*, op. cit., p. 114.

³² Polypus and other Morbid Growths in the Nose; their Radical Treatment by the Electro-Cautic Method, and their Connection with Asthma: London *Lancet*, April 17, 1880, p. 594.

pending on the contracting of the resulting cicatrices to draw the tissues down tightly over the turbinated bone, and leave the opening free.

: In case of simple hypertrophy of the superficial tissue, with but moderate narrowing, I use a small flat-blade cautery, as shown in Fig. 5, *b*, which is pressed flatly against the surface until sufficient tissue is destroyed. In case it is desirable to cauterize deeper into the cavernous tissue, I turn the blade edgewise. For this purpose Dr. Bosworth has devised a very convenient blade, with the cauterizing surface on one side only.³³

In cases of excessive hypertrophy I prefer an electrode which I have devised, with a flattened spiral point made quite broad, as shown in Fig. 5, *a*, which is introduced into the nostril heated to a bright red heat, and passed along the end of the turbinated bone, thus destroying the tissue in mass.

This method of removing this tissue in mass from the whole length of the turbinated bone has given me the most satisfactory results, on account of its speedy effect and permanent results; and I have come to consider it in all cases of marked hypertrophy decidedly preferable to the plan of superficial cauterization, or of scarification by linear incision.

For the hypertrophies on the septum, and minor points on other parts, the small electrode should be used.

In the application of the galvano-cautery certain precautions should be observed. The vestibule and parts of the nasal passages anterior to the turbinated bones should not be cauterized, as the contraction which follows will tend to constrict the passage. On the turbinated bones it is quite different. They, being con-

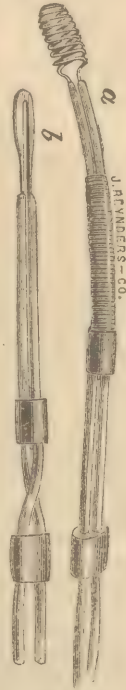


FIG. 5.

³³ Vide MEDICAL RECORD, op. cit., p. 510.

vex, the cicatricial contraction draws the tissues down more tightly over them, and leaves the passages more free.

In removing hypertrophies from the septum, care should be taken to touch only the parts to be burned, and then not to burn too deeply.

In those cases in which a rhinoscopic examination enables one to make the diagnosis of the hypertrophy on the septum, with a little dexterity the electrode can be guided by the aid of the rhinoscopic mirror so that the surgeon can see when sufficient tissue has been destroyed.

This is also true of hypertrophies on the posterior ends of the turbinated bones, particularly in those cases in which the posterior pharyngeal space is wide, and the patient has good control over the soft palate.

In cases in which the progress of the cauterization cannot be watched as above suggested, and since it cannot be determined by anterior inspection, when the end of the electrode has reached the posterior ends of the turbinated bones, the depth of the nasal chamber should be accurately measured with a probe and marked on the electrode. From this should be deducted the distance (ordinarily about one inch) from the posterior ends of the turbinated bones to the posterior pharyngeal wall, and the result gives the depth to which the electrode should be introduced.

By thus exercising due precaution, the accident of cauterizing the mouth of the Eustachian tube, or other parts not to be touched, can be avoided.

When using the large, spiral point, it is by far the best plan to heat it before introducing, as the length of time required to heat it when in contact with the tissues may elevate the temperature of the air in the nasal fossæ to the detriment of the ear, but the small one heats so quickly that it is best placed in position before the connection is made.

I employ Dawson's battery and Leiter's universal handle, in which the electrodes all fit. The handle contains a current-breaker, giving perfect control of the electric stream, thus removing all danger if the manipulations are properly and carefully made.

Dr. Shurley,³⁴ of Detroit, has devised a very convenient handle for holding the electrodes; also Dr. Bosworth³⁵ has recently constructed a handle which, although in many respects similar to that of Dr. Shurley, is, I should judge, the most convenient han-

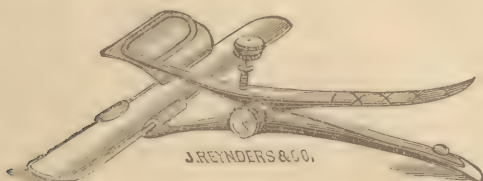


FIG. 6.

dle of all, although I have not as yet had an opportunity of using it.

The best form of speculum is that of Shurley, which I have modified by widening the outer blade and closing the aperture with an ivory plate, as shown in Fig. 6, so as to more thoroughly protect the outer side of the nasal opening when the heated electrode is introduced.

I have, also, a number of short, thin, ivory blades, made of different widths, to correspond with the size of the nose (see Fig. 7). These I introduce at the sides of the speculum, one above and one below, to protect the upper and lower borders of the passage from any possible injury.



FIG. 7.

I have also a very convenient speculum (see Fig. 8) with an ivory slide on one side, to be introduced along the septum to protect it from injury. It is made of ivory or of annealed glass, like Dr. Goodwillie's nasal shield. It is made in three sizes, to correspond with the size of different noses. It also makes a very light and convenient speculum to use in the application of acetic acid or other caustics.

³⁴ The Galvano-Cantery as a Therapeutical Measure in Chronic Nasal and Naso-Pharyngeal Catarrh: The St. Louis Med. and Surg. Journal, January 5, 1880, p. 38.

³⁵ Op. cit.

The pain attending the application of the cautery is generally slight, and therefore does not usually require an anæsthetic. A few sniffs of chloroform, to remove the sensitiveness of the nostril, and to prevent sneezing on the introduction of the speculum, is all that is necessary.

In children, an anæsthetic is necessary to keep them quiet, and for them chloroform is preferable. Sometimes, however, from fear, an anæsthetic is necessary in adults; for this reason, in three cases, I have given nitrous oxide gas. The after-effect, for about a week, is to cause one to feel as if he had taken a severe cold, occasionally to feel quite sick, accompanied by a severe headache, but in no case have I had anything but a favorable result.

Dr. Daley,³⁶ of Pittsburg, reports severe aural



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FIG. 8.

complications resulting from the operation, but this may be due to the method employed, *i. e.*, introducing the electrode cold and allowing it to become heated in the posterior pharyngeal space before applying it to the tissue, thus superheating the air in the pharyngeal vault, which, entering the ear, may have caused the difficulty; or the mouth of the Eustachian tube may have been accidentally cauterized.

Other methods are used for the removal of this redundant tissue.

Dr. Goodwillie³⁷ employs, in some cases, the thermo-cautery, but at the same time remarks that "the galvano-cautery is by far the most efficient cautery to be used in the nose."

Dr. Robinson, of New York,³⁸ has employed a pair of strong forceps with biting blades, by which this

³⁶ An Analysis of the Value of the Galvano-Cautery in the Treatment of Diseases and Growths of the Naso-Pharynx: Trans. Am. Med. Assn., 1880, p. 654.

³⁷ Op. cit.

tissue is forcibly torn away, sometimes taking a tur-
 binated bone with it. This, at best, seems a very
 harsh and unwarrantable procedure, and is attended
 by profuse hemorrhage. In cases where the hyper-
 trophied tissue is more or less pedunculated, or pro-
 jects in the form of a rounded mass, it can be very
 satisfactorily removed by the wire *écraseur* devised
 by Dr. Jarvis, of New York.³⁹

The application and retention of the wire is faci-
 litated by transfixing the mass with a long, slender
 needle, and passing the wire over the needle, when
 the tissue can be slowly cut through. In a number
 of cases I have found it very efficient, but in cases
 where the hypertrophy is moderate and distributed
 over a larger surface, my experience accords with
 Dr. Shurley's in the use of the snare in the nasal
 passages, that at each attempt "to learn how diffi-
 cult it is to apply it."⁴⁰

In hypertrophy on the nasal septum the snare can
 very seldom be used.

In the removal of other less common obstructions
 of the nose, such as foreign bodies, polypi, adenoid
 growths in the vault of the pharynx, syphilitic cic-
 tricial contraction, or membranous occlusion, each
 must be dealt with according as the exigencies of the
 case demands.

I will briefly cite from my note-book a few cases
 by way of illustration, as we meet them in practice
 —those, however, in which the main treatment was
 with the galvano-cautery.

CASE I.—Mr. T. J——, of North Rush, thirty-three
 years of age. Referred to me September 18, 1879,
 by my late friend, Dr. J. F. Denman, of Scottsville.
 During the fall of 1877, as the result of a severe cold,
 his nostrils became closed so he could scarcely
 breathe through them. This condition continued,
 and was attended by a profuse muco-purulent dis-
 charge. He suffered from a constant dull, heavy
 pain in the frontal region, was restless at night and
 his sleep broken. His throat was constantly parched,

³⁸ American Jour. Med. Science, April, 1877, p. 435; also, A Treatise on Nasal Catarrh, p. 114. 1880.

³⁹ Presented before the Am. Laryng. Assn., June 2, 1880; also, vide Dr. Bosworth's article, New York MEDICAL RECORD, op. cit., p. 511.

⁴⁰ Op. cit.

and he had an unpleasant taste in the mouth, particularly in the morning.

Examination revealed closure of the nostrils from hypertrophy of the tissue covering the inferior and middle turbinated bones.

The hypertrophied tissue was thoroughly destroyed in both nostrils by the galvano-cautery; no febrile symptoms followed. On the third day I removed a large slough from both nostrils. The surfaces soon healed, his nostrils were left free and unobstructed, and all his unpleasant symptoms disappeared.

CASE II.—Mrs. M. C——, aged thirty-seven years. Referred to me by Dr. Farley, October 16, 1879. She had suffered from a severe nasal catarrh and stoppage of the nostrils for five or six years, a sensation of pressure in the nasal region, a frontal headache, and a profuse watery discharge from the nostrils.

On examination, a small polypus was found in each nostril, filling the slight opening between the hypertrophied turbinated bones. The polypi were removed by the snare, after the base of the growths and the hypertrophied tissue was thoroughly destroyed by the electro-cautery. As soon as the slough was removed and the surfaces healed the nostrils became clear, the watery discharge ceased, and she has remained free from nasal and catarrhal trouble since.

CASE III.—G. C——, aged twenty-seven years, theological student, consulted me April 5, 1880, for obstruction and difficulty in breathing through the nose, which had annoyed him for about ten years, and was attended by all the symptoms of an obstinate nasal catarrh. Had a sensation of pressure about the bridge of the nose and frontal region, eyes weak, unable to use them but for a short time each day, and also complained of inability for mental application. Throat sensitive and tires easily on speaking, his voice has a marked nasal twang, but no hoarseness. He snores loudly at night, and arises in the morning with a headache, dry, parched throat, and a bad taste in the mouth. General health fair.

Examination.—Nasal obstruction from hypertrophy of tissues on inferior and middle turbinated bones on

both sides. Naso-pharyngeal and laryngeal catarrh. Pharynx granulated.

The treatment first instituted was the thorough removal of the hypertrophied tissue in the nose with the galvano-cautery. After the surfaces had healed and free nasal respiration was established, the pharyngeal and laryngeal trouble yielded readily to treatment, and a complete and permanent relief resulted. His eyes became strong and his head clear.

On meeting him a few days ago he said he rejoiced to tell me how well and free he was from all his old nasal and throat difficulties.

CASE IV.—T. K—, of Buffalo, aged twenty-three years, came under my care July 30, 1880. For two years past has had considerable trouble in the throat, subject to frequent colds, and a severe and almost constant cough, with a slight mucous expectoration.

Has obstructed nostrils and constant discharge from head. Is weak and anæmic and losing flesh quite rapidly. His friends are apprehensive of consumption.

Examination.—Chronic laryngitis and slight bronchitis. Nares obstructed on right side by an exostosis from inferior turbinated bone; on left side by hypertrophied tissue.

The hypertrophied tissue was removed by the galvano-cautery electrode. The exostosis in the right nostril by a pair of nasal bone forceps. By local applications applied to larynx and inhalations, together with tonics internally, he improved very rapidly, and at the end of two months he had gained in weight thirty pounds.

Nasal respiration is now entirely free. There is no irritation about the throat or lungs, and he is entirely well.

CASE V.—Henry S—, four and a half years old. Was brought to me by his parents for treatment of obstructed nostrils and catarrh. He breathed entirely through the mouth, and had done so since birth; was subject to very frequent colds, which increased the nasal discharge and he was becoming quite deaf.

Examination.—The septum of the nose was very crooked, bent in the shape of an S (as referred to in

the early part of this paper), obstructing both nostrils. He also had very large tonsils.

Treatment.—First removed both tonsils; after the cut surfaces had healed I anæsthetized the child and fractured the septum by a pair of Adams' forceps, and held the septum in place by means of a pair of ivory plugs until it reunited.

After this the right nostril remained obstructed by some hypertrophied tissue on the inferior turbinated bone. This I removed by the electro-cautery. In the vestibule of the left nostril there was some hardened tissue which greatly contracted its calibre. This I decided to remove with London paste, as I did not desire the marked cicatricial contraction which follows destruction by the electro-cautery. The removal of this tissue by the paste I have not quite completed, but even now, with the right nostril free, he has but little or no difficulty in breathing entirely through the nose, and his hearing is restored.

CASE VI.—R. A. H——, Bath, N.Y., aged twenty-four years, came under treatment January 18, 1881, for an aural trouble associated with obstructed nostrils and nasal catarrh.

Been slightly deaf in right ear, with marked tinnitus, for six or seven years, which he attributed to diving, and to the entrance of water into that ear while swimming. Also slight deafness and tinnitus in left ear for two years.

The aural trouble seems to sympathize very actively with the nasal trouble, for when the catarrh and nasal trouble is aggravated the deafness and tinnitus is greatly increased. It is markedly affected by damp weather, winds, dust, exposure to cold, damp or wet feet, and often even by moderate exercise. He has also a mild chronic laryngitis. General health is very good.

Examination revealed hypertrophy of the inferior and middle turbinated bones, more particularly at the posterior ends, and also hypertrophy of the tissues along the lower portion of the septum, as shown in illustration, Fig. 3. (From this case the drawing was made.) The mouths of the Eustachian tubes were thickened and filled with a catarrhal secretion. Membrana tympani very concave.

Treatment.—Applied the galvano-cautery to hypertrophied tissue of the turbinated bones and septum, guided the electrode at the posterior portion by the aid of the rhinoscopic mirror.

Marked febrile symptoms and severe headache followed on the fourth day and continued two days. No aural complications. After the sloughs were removed and the surfaces healed the nasal passages were free and clear, and the aural symptoms much relieved, so that, with the necessary subsequent treatment which this case requires, the prospects are good for a more or less complete recovery from this aggravated and distressing aural trouble.

It will be unnecessary to cite more cases to illustrate the evil results of obstructed nostrils and the beneficial results following the operation of removing these obstructions. By these means we are enabled to provide our patients with luxuriously free nasal passages, to remove the main cause for the invariably accompanying persistent and annoying nasal catarrh, and, after removing this barrier to apply other effectual means of treatment to the diseased portions of the naso-pharyngeal mucous membrane; and are compelled no longer to cant with Niemeyer that "chronic catarrh of the nares is a very obstinate disease, which not seldom mocks at every treatment, and often lasts with changing intensity for many years."

In conclusion, gentlemen, this subject of nasal stenosis and mouth-breathing does not elicit the close and careful attention which it deserves.

We are all apt to become intensely interested in a new method of dressing for a fracture, a rare form of heart disease which is inevitably fatal, or a new type of fever that will get well spontaneously, but these so-called minor ailments are allowed to go unheeded, gradually undermining our superstructure, destroying our organs of special sense, cutting us off from social pleasures, and rendering us unfit to fully enjoy the life we so dearly cling to.

It is in the early stage of these difficulties that our work becomes most effective and curative.

The sanitarians devote a vast amount of time to devising the most effective means for *house ventilation*. If an equal amount of time were devoted

to *nose ventilation*, I am sure that quite as much misery would be prevented.

Much can be accomplished toward obviating this unfortunate condition by timely attention, in children, to the maintenance of free nasal respiration, thereby preventing the formation of the habit of mouth-breathing.

Catlin, in his travels among the American Indians, covering a period of about ten years, found among two millions of them living in a savage state but three or four deaf mutes, and not a single case of deafness, nor could a case be remembered by any one of the one hundred and fifty chiefs whom he interrogated.

This is explained by the Indian mothers training their babes to breathe by the nostrils alone, and never to open their mouths except to take food or to use their tongue.

Another important fact to be observed is that among the Indians in a state of nature, ear, throat, and lung diseases, and particularly consumption, are almost unknown.

The same is true of ear and lung diseases in the lower animals, and they are invariably nose-breathers.

As we all know, the use of an organ will strengthen, expand, and develop it, whereas from lack of use it soon shrinks away, and becomes rudimentary. So with the nose; if it is allowed to go unused, and mouth-breathing is established, a tissue change will take place in the nostrils leading to narrowing, and in many instances complete closure of them, just as "a disused pathway will become covered over and at last choked up by rank and luxuriant vegetation."

